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Psychological Bulletin

EDITED BY

SHEPHERD I. FRANZ, GOVT. HOSP. FOR INSANE
SAMUEL W. FERNBERGER, CLARK UNIVERSITY (*Assistant Editor*)

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)JOHN B. WATSON, NEW YORK (*J. of Exp. Psych.*)

JAMES R. ANGELL, 522 FIFTH AVENUE, NEW YORK (*Monographs*) AND
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WESTERN UNIVERSITY; G. M. WHIPPLE, UNIVERSITY OF ILLINOIS; R. S. WOODWORTH,
COLUMBIA UNIVERSITY.

ASSOCIATION NUMBER

CONTENTS

*Proceedings of the Twenty-ninth Annual Meeting of the American Psychological
Association, Chicago, Illinois, December 28-30, 1920. Report of the Secre-
tary, E. G. BORING: 57. Abstracts of Papers: 65.*

Books Received: 109.

Notes and News: 110

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THE
PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-NINTH ANNUAL
MEETING OF THE AMERICAN PSYCHOLOGICAL
ASSOCIATION, CHICAGO, ILLINOIS
DECEMBER 28, 29, 30, 1920

REPORT OF THE SECRETARY, EDWIN G. BORING, CLARK
UNIVERSITY

The American Psychological Association held its twenty-ninth annual meeting at the University of Chicago on Tuesday, Wednesday and Thursday, December 28, 29, and 30, 1920. The sessions were held in the rooms of the Law Building and were largely attended. One hundred forty-eight names were registered on the Association's roll and very many more persons participated in the meetings. Fifty-seven papers were read: seven in general psychology, sixteen in experimental psychology, sixteen in clinical psychology and intelligence tests, seven in other branches of applied psychology, six in comparative psychology, and five in social psychology.

The sessions of the Section of Psychology and the Section of Education of the American Association for the Advancement of Science constituted together a parallel program which was held in the same building with the meetings of the Association and which was attended largely by members of the Association. On Wednesday morning the Association held a joint session devoted to the subject of intelligence tests with these two Sections. On Wednesday afternoon Professor Yerkes delivered the vice-presidential address to Section I, which was attended by the members of the Association.

On Tuesday afternoon the Section of Clinical Psychology held its principal program which was, however, open to all members of the Association. The session was followed by the business meeting of the Section of Clinical Psychology.

The large number of papers made it necessary to conduct parallel sessions at all times except Tuesday morning. There were thus with the sessions of Sections I and Q usually three simultaneous sessions among which the members circulated according to the nature of the programs.

The annual banquet was held in Ida Noyes Hall with one hundred fifty persons present. After the banquet the retiring President, Mr. Franz, read his presidential address on "Cerebral-Mental Relations." Messrs. Cattell, Judd, Scott, and Pintner contributed personal reminiscences of Wilhelm Wundt. Professor Jaederholm, the Association's guest from Sweden, and Professor McDougall, newly from England and elected to the Association's membership, were called upon for remarks.

The apparatus exhibition was held in the Law Building and the C. H. Stoelting Company of Chicago made an extensive exhibit. In addition Mr. Bean exhibited a portable stadiometer and portable school scales, Mr. Ruckmick photographs of emotional expressions, and Mr. Pressey the X-O tests.

TRANSACTIONS AT THE ANNUAL BUSINESS MEETING

The Annual Business Meeting was held on December 30, from four until nearly seven p.m., in the Law Building.

It was voted that the minutes of the previous meeting be approved as printed.

The Secretary announced the deaths of the following members of the Association during the year 1920: Elmer Ernest Southard, February 8, 1920, aged forty-three; Kathleen C. Moore, July 24, 1920, aged fifty-three.

The Secretary announced that the Association had been represented by Mr. Dashiell at the inauguration of President Chase, one of its members, at the University of North Carolina.

The following items of business were reported from the Council and acted upon by the Association:

1. The Treasurer's report as printed below was read and accepted.

2. The Treasurer reported the following estimate of resources for the year 1921:

ESTIMATE OF RESOURCES

| | | |
|---------------------------------------|----------|------------|
| On deposit..... | \$284.76 | |
| Dues (approximate)..... | 825.00 | |
| Interest (approximate)..... | 50.00 | |
| Sale of monographs (approximate)..... | 5.00 | \$1,164.76 |

3. Upon recommendation of the Council the following budget for 1921 was approved:

BUDGET

| | | |
|--|----------|------------|
| Printing and supplies..... | \$325.00 | |
| Postage..... | 125.00 | |
| Reprints..... | 150.00 | |
| Abstracts..... | 50.00 | |
| Incidentals of meeting..... | 50.00 | |
| Apparatus Exhibition..... | 25.00 | |
| Election committee..... | 70.00 | |
| Secretary's stipend..... | 250.00 | |
| Committee on Qualifications and Certification of Consulting Psychologists..... | 50.00 | |
| Standing Committee on Certification of Consulting Psychologists..... | 50.00 | \$1,145.00 |

4. The Secretary announced for the Council the appointment of a program committee for 1921, consisting of the Secretary, Mr. Langfeld, and Mr. F. L. Wells.

5. It was announced that no invitations had been received for the meeting in 1921, and that the Council deemed it inadvisable to meet with the American Association for the Advancement of Science at Toronto. On recommendation of the Council it was voted that the determination of the place and time of the next meeting and the appointment of the local member of the executive committee be referred to the Council with power to act.*

6. On nomination by the Council, Mr. E. K. Strong, Jr., was elected as representative of the Association for 1921 on the Council of the American Association for the Advancement of Science.

7. On recommendation of the Council the following thirty-seven persons were elected to membership in the Association:

Adams, Henry Foster, Associate Professor, University of Michigan.

Bagby, English, Ph.D., Instructor in Psychology, Yale University.

Bills, Marion A., Ph.D., Assistant in Clerical Research, Carnegie Institute of Technology.

Bird, Grace Electa, Ph.D., Professor of Educational Psychology, R. I. State College.

Blanchard, Phyllis, Ph.D., Interne Psychologist, Bellevue Hospital, N. Y. City.

Bott, Edward A., B.A., Lecturer in Psychology, University of Toronto.

Bridgman, Olga L., M.D., Ph.D., Assistant Clinical Professor of Abnormal Psychology, University of California.

Castro, Matilde, Ph.D., Professor of Education, Director of Model School, Bryn Mawr College.

Chamberlin, Edwin M., Ph.D., Professor of Psychology, College of Business Administration, Boston University.

* The Council has since accepted the invitation of Princeton University for the Association to hold its thirtieth annual meeting at Princeton on December 28-30, 1921, and has appointed Mr. C. C. Brigham local member of the executive committee.

- Chassell, Clara Frances, Ph.D., Instructor in Experimental Education, Teachers College, Columbia; Psychologist, Horace Mann School.
- Chassell, Laura Merrill, Ph.D., Instructor in Psychology, Ohio State University.
- Coburn, Charles A., Ph.D., Assistant Professor of Psychology, Boston University.
- Conklin, Edmund S., Ph.D., Professor of Psychology, University of Oregon.
- Dimmick, Forrest L., Ph.D., Instructor in Psychology, Northwestern University.
- Friedline, Cora L., Ph.D., Adjunct Professor, Randolph-Macon Woman's College.
- Gatewood, Esther L., Ph.D., Research Assistant, Carnegie Institute of Technology.
- Griffith, Coleman R., Ph.D., Instructor in Psychology, University of Illinois.
- Henry, Theodore S., Ph.D., Professor of Psychology, Western State Normal School, Kalamazoo, Michigan.
- Hoisington, Louis B., Ph.D. Instructor in Psychology, Cornell University.
- Howard, Delton T., Ph.D., Assistant Professor of Psychology, Northwestern University.
- Humphrey, George, Ph.D., Assistant Professor of Psychology, Wesleyan University.
- Humpstone, Henry J., Ph.D., Professor of Psychology, University of North Dakota.
- Jordan, Arthur M., Ph.D., Professor of Psychology, University of Arkansas.
- Kingsbury, Forrest A., Ph.D., Assistant Professor of Psychology, University of Chicago.
- Link, Henry C., Ph.D., Director of Education, U. S. Rubber Company, Footwear Division, New Haven, Conn.
- McDougall, William, M.B., F.R.S., Professor of Psychology, Harvard University.
- Ordahl, George, Ph.D., Psychologist, Sonoma State Home, Eldridge, California.
- Otis, Arthur S., Ph.D., Camp Grant, Illinois.
- Pressey, Luella Cole, Ph.D., Research Fellow, Indiana University.
- Rice, D. Edgar, Ph.D., Division of Testing and Grading, Camp Grant, Illinois.
- Robbins, Samuel D., Ph.D., Director, Boston Stammerers' Institute.
- Root, William T., Ph.D., Head Department of Educational Psychology, University of Pittsburgh.
- Shaw, Edwin A., Ph.D., Assistant Professor of Education, Harvard University.
- Toops, Herbert A., Ph.D., Development Specialist in Vocational Tests, Camp Grant, Illinois.
- Wells, Wesley R., Ph.D., Assistant Professor of Philosophy and Psychology, Colby College.
- Williams, J. Harold, Ph.D., Director, California Bureau of Juvenile Research, Whittier, California.
- Wooster, Margaret, Ph.D., Assistant Professor of Psychology, Beloit College.

8. On recommendation of the Council it was voted that a committee of three, to include the Secretary, be appointed by the President to revise the requirements for membership and to report at the next annual meeting of the Association.

9. On recommendation of the Council it was voted that no nomination of a new member be considered unless it be accompanied by letter in support of the nomination signed by one of the nominators. A motion that the new membership committee prepare a blank calling for fuller information concerning each candidate was lost.

10. The Council recommended that persons residing in foreign countries be not elected to active membership; that distinguished

psychologists in foreign countries be elected, upon recommendation of the Council, corresponding members of the Association; and that such corresponding members be not subject to the payment of dues. It was voted to refer the matter to the new committee on qualifications for membership.

11. The Council recommended the establishment of a treasurer-ship by the amendment of Article III, Section 1, of the Constitution to read as follows:

The Secretary and the Treasurer of the Association shall be nominated by the Council and elected by the Association at an annual meeting, and shall serve for a term of three years.

The recommendation was approved, and goes over to the next annual meeting for second passage.

12. On recommendation of the Council it was voted that the President appoint a committee of three members to consider manuscripts submitted to Mr. Bingham in competition for the Thomas A. Edison prize for the most meritorious research on the effects of music, and to report to the Council thereon; that the time for the submission of manuscripts be extended to October 1, 1921; that the payment of the prize be not made until the successful manuscript is published or accepted for publication; and that the Association express its thanks to Mr. Edison for the donation of the prize and to Mr. Bingham for his organization of the plan.

13. The Council recommended the adoption of a set of by-laws which embody the various actions of the Association since its organization. It was voted that the proposed by-laws be printed in the Year Book and action upon them deferred until the next annual meeting.

The President then called for reports of committees.

Mr. Scott reported for the Committee on the Election of Officers the following elections:

President, Margaret Floy Washburn, Vassar College.

Members of the Council, 1921-1923, George F. Arps, Ohio State University, Walter S. Hunter, University of Kansas.

Nominees for appointment to the Division of Anthropology and Psychology of the National Research Council, Walter B. Pillsbury, University of Michigan, George M. Stratton, University of California.

Mr. Warren reported progress for the Committee on Terminology, and it was voted at his request that the committee be continued.

Mr. Seashore reported for the joint committee on the publication

of abstracts. The report presented the following plan for an abstract journal:

The Psychological Review Company offers to initiate a system of abstracts of publications on psychological subjects to be published for the present in connection with the Psychological Bulletin, provided the American Psychological Association or individuals will guarantee a maximum of \$1500, to provide against a possible deficit; the guarantee to extend over two years at not more than \$750 a year.

It is proposed to devote six issues of the Psychological Bulletin to these abstracts, the alternate numbers being devoted to reviews, reports, notes, *etc.* The editors are endeavoring to secure the coöperation of foreign psychologists through the medium of their journals, as well as the coöperation of American psychologists in making the abstracts. The number of pages in the Bulletin will be increased as far as necessary. The abstracts will be grouped in each issue under a few general headings. The plan of abstracting suggested at the meeting will be followed as nearly as may be. The editor of the Psychological Bulletin, however, will assume final responsibility for the form of the abstracts.

The Committee recommended the adoption of this plan and the pledge of the coöperation of the Association in the enterprise, with the exception that Mr. Yerkes expressed himself as disapproving the use of the Association's funds to underwrite the venture. On motion of Mr. Judd it was voted that the report be received and the Committee discharged, that final action be postponed until the next annual meeting, and that the President appoint a committee of seven to take into consideration the report already rendered and the general matter of the relation of the Association to scientific publication. The recommendation of the Council that the Association underwrite the proposed guarantee for the new abstract journal up to the present amount of the principal fund was referred to this committee. It was voted that the committee of seven include three members of the discharged committee.

Mr. Baldwin reported for the Committee on Qualifications and Certification of Consulting Psychologists, presenting a printed report. The Council recommended that, in the case of the adoption of the report, the expenditure of the standing committee created be contingent upon the funds collected as fees by the committee. After considerable discussion Mr. Seashore moved that the Association adopt the report of the committee. Mr. Yerkes moved to amend the report by striking out the provision for the withdrawal of a certificate once awarded and by the inclusion of the recommendation of the Council to limit the budget of the standing committee to the amount of the fees collected. The report was adopted as amended, and the committee discharged. On motion of Mr. Judd it was voted that the Standing Committee on Certification

of Consulting Psychologists, created by the report, be instructed to grant no certifications until it has rendered a full report to the Association of the procedure which it will adopt.

The President then called for new business.

On motion of Mr. Jastrow it was resolved that the following message be sent to President G. Stanley Hall:

Resolved that the following message be sent by the Secretary of the American Psychological Association to President Emeritus G. Stanley Hall, Clark University, Worcester, Mass.:

The members of the American Psychological Association express to you, on the occasion of your retirement from active duties, their appreciation of your long and distinguished services to psychology and education; and extend to you their cordial good wishes for further years of health and happiness in the completion of your life-work.

On motion of Mr. Cattell the following resolution was adopted.

Resolved that the American Psychological Association places on record its sincere thanks to the University of Chicago and to the psychologists of the University and of the city for the admirable arrangements made for the scientific sessions of the Association and for the entertainment of its members.

The meeting adjourned at 6:50 p.m.

REPORT OF THE TREASURER FOR THE YEAR 1920

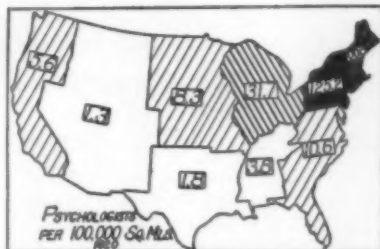
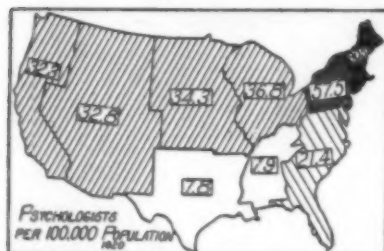
| DR. | | |
|--|------------|------------|
| To balance from the previous year..... | \$1,551.32 | |
| Dues received from members..... | 766.28 | |
| Interest from July 1, 1919 to July 1, 1920..... | 53.86 | |
| Sale of Monographs 51 and 53 in 1919..... | 7.67 | \$2,379.13 |
| CR. | | |
| By Printing and Supplies..... | \$183.03 | |
| Postage..... | 93.56 | |
| Reprints..... | 51.50 | |
| Incidentals of 1919 meeting..... | 12.21 | |
| 1919 Apparatus Exhibition..... | 7.06 | |
| 1920 Election Committee..... | 28.25 | |
| Secretary's Stipend for 1920..... | 250.00 | |
| Exchange on Checks..... | 2.10 | |
| Committee on Academic Status of Psychology.... | 126.85 | |
| Committee on Qualifications and Certification of Consulting Psychologists..... | 53.34 | \$ 807.90 |
| Balance in Fifth Avenue Bank..... | 284.76 | |
| Balance in Union Dime Savings Bank..... | 1,286.47 | \$2,379.13 |

WORCESTER, MASSACHUSETTS,
December 21, 1920
Audited and found correct:
C. S. YOAKUM,
B. T. BALDWIN

EDWIN G. BORING,
Treasurer

GEOGRAPHICAL DISTRIBUTION OF PSYCHOLOGISTS

The Secretary has published a statistical analysis of the subjects of instruction and research and other personal data of the membership of the Association in 1920 (PSYCHOL. BULL., 1920, 17, 271-278). Because it bears upon the question of the most desirable location for the annual meeting, he takes this opportunity to submit data on the geographical distribution of the membership of the Association in 1920 as indicated in the figures below. The center of the psychological population of the United States in 1920 lies approximately at latitude $40^{\circ} 45'$ and longitude $84^{\circ} 15'$. This point is about seven miles west of Lima, Ohio, one hundred miles north of Cincinnati, one hundred twenty-five miles southwest of Detroit, and one hundred ninety miles southeast of Chicago. This center is the average center, not the medium.



TITLES AND ABSTRACTS OF PAPERS

Cerebral-Mental Relations (Presidential Address). SHEPHERD
IVORY FRANZ, Government Hospital for the Insane.

GENERAL PSYCHOLOGY

Functional Psychology in the Laboratory. DELTON THOMAS HOWARD,
Northwestern University. (Introduced by R. A. Gault.)

There are two sciences of psychology. The first is the science of experience "as dependent on the human organism." It aims at the identification, analysis, and description of those items of experience that are found to be dependent—as to their being-in-experience, their appearance and disappearance—on the human nervous system. This science has nothing to do with the uses, possibilities, or meanings of things. It is concerned with dependent phenomena only for the purpose of determining their status as existences in the natural order of the world.

The second science of psychology may be called the "science of consciousness." By consciousness is meant a specific type of human activity (not the mere presence in experience of things). Looking, listening, sensing, discriminating, judging, reasoning, are conscious or control activities. They are activities a man engages in for the purpose of determining the meaning, value, or possibilities in the way of consequences of any datum of experience that happens to need that treatment. It is this evaluating, problem-solving, stimulus reconstructing process that constitutes the subject-matter of "functional" psychology. Conscious activity may be distinguished from reflex and automatic forms of response by reference to the stimulus. For whereas unconscious or automatic response follows serially and causally upon the excitation of the end-organ, consciousness holds up the stimulus, scrutinizes it, seeks to find out what it signifies in the way of consequences.

The first type of psychology is already established as an experimental science. Functionalism must become experimental or surrender its claim to be an empirical science.

The conscious process is concrete, an activity of the whole man (not an activity occurring in the "depths of the soul"). If this

is true, then it ought to be subject to experimental investigation. With this thought in mind I have undertaken certain laboratory studies of consciousness, now going forward. I give a brief sketch of these experiments.

What Should be Taught in the Introductory Course? L. L. THURSTONE, Carnegie Institute of Technology.

The fundamental trouble with conventional textbook psychology is its emphasis on the momentary psychosis. This is the main point of the paper.

We are ignoring the permanent trends, the life motives that determine our character traits, and the compensations and sublimations that determine our social successes or failures. Our textbooks in psychology are entirely lacking in socially significant content. Practically all of our content centers around the momentary mental states.

The whole subject of sensation including such teaching items as the doctrine of specific energies, cold and warm spots, theories of hearing, peripheral vision and color mixture, all refer to the momentary psychosis.

We might continue to teach our barren subject if no other content were available but that is not necessary. Those of the medical profession who are interested in mental phenomena have busied themselves with the permanent cravings and life motives which really determine our careers. That is the fundamental difference between the content of orthodox psychology and the psychology which the medical profession has contributed.

I do not wish to convey the impression that we should do away with the conventional categories. Far from it. But I should like to see our present main categories such as perception, imagination, the concept, and others, serve a secondary rôle as *stages* in the act.

My object with this sketchy outline is to show that we have entirely failed in our textbooks to deal with socially significant and interesting content and that we must turn to the literature of psychiatry, abnormal psychology, psychoanalysis, psychopathology, and mental hygiene, for the psychological principles that really count.

The most important task for psychologists at the present time is to organize and rewrite the material of these studies in psychologically acceptable form with special reference to the normal mind.

We have within reach in the direction which I have indicated

the possibility of making ourselves more generally accepted by the public and our subject the most popular one on every college campus.

An Objective Interpretation of Meanings. J. R. KANTOR, Indiana University.

Paradoxical as it may seem it is still true that the problem of meanings, which provided so much difficulty for the introspective psychologist, presumably because meanings seemed to possess essentially an inner character which could not be connected with mental content of any particular sort, meets with an easy solution by the methods and materials of the objective psychologist. From an objective viewpoint meanings are concrete and actual, although implicit, responses to objects as stimuli. In their functioning meanings are precurrent adjustments in the sense that they anticipate and condition what the final adjustment to any particular object is to be. Meanings, then, for the objective psychologist refer to definite differential responses acquired by actual contact with objects, their qualities and relations as they have served to stimulate the person. The differential responses are evaluatory reactions which make for orderly and appropriate adjustments of the individual to the surrounding things.

The development of meanings is therefore a process of acquiring particular sorts of reaction systems as they arise from the person's contact with objects. But how do these reaction systems function as meanings in later adjustments? The answer is that the meaning reactions become detached from the original stimulus-response situation and operate separately. Obviously this reaction when operating in relative independence of the original situation is a truncated or partially occurring act. Thus the meaning of a candle flame to a child may be the operation of merely the seeing phase detached from the original seeing-touching reaction.

The highest point of development in meaning reactions is marked by the acquisition of numerous symbolic reactions which serve as anticipatory responses to other appropriate final reactions. The development and operation of meanings are most effectually aided by the use of language and speech symbols substituted for the original adjustment.

The Validity of Votes. J. McKEEN CATTELL, Garrison-on-Hudson, N. Y.

In order to select on two occasions groups of a thousand men

of science for statistical study, the workers in each science were arranged in the order of the merit of their work by ten of their more distinguished colleagues. The average position of each was calculated, together with a probable error which shows the validity of the position and also measures the differences between the men. In a third selection of scientific men a general vote has been obtained by methods described in this paper. For example by a preliminary vote a hundred psychologists were selected and each was then asked to select from this group the fifty who have done the best work in psychology and the five whose work has been most important. Eighty-four replies were received; the vote for each of the hundred ranged from 84 to 3, or counting the double votes for the five leading psychologists from 144 to 3; 35 five votes gave a man a place among the fifty. The problem treated in the paper is the assignment of a probable error to the positions obtained by such a vote. It is a question of some theoretical and practical interest, for it is often desirable to know the validity of a vote. Thus if the independent opinion, say, of six of the eight members of the council of the American Psychological Association is favorable to a given measure, how likely is this to represent a majority vote of all the members? Similar questions arise whenever a division of opinion and a vote occur, as in an election or in a trial by jury, where we may assume that there is a random selection from a larger group.

Effects of Music. W. V. BINGHAM, Carnegie Institute of Technology.

The major interest of investigators in music-psychology has naturally centered in the task of analysing and explaining the phenomena of musical pleasure. But in addition to these esthetic phenomena, the psychologist must recognize that responses to music include varied phenomena not comprehended within the scope of musical esthetics.

Certain of these effects are of both theoretical and practical import. Thus, muscular tension and strain is diminished or increased, depending on the type of the selection. Some music soothes, quiets, rests and relaxes, while other types of selections are predominantly stirring, exciting or stimulating in their effect. Routine movements of skill and dexterity may be facilitated or hampered by music. Artistic fancy or constructive imagination of other sorts, may be initiated. The thought processes are speeded up or retarded. Prevailing moods are modified.

In this paper, certain difficulties of control and of objective measurement are pointed out and considerations of method and technique in attacking outstanding problems are touched upon.

The Common Sense of the "Stimulus-Error." E. G. BORING,
Clark University.

The stimulus-error is a descriptive term which applies in cases where the correlation between stimulus and response is equivocal because of a failure in the scientific control of certain middle terms that affect the stimulus-response relation. Although the history of the stimulus-error indicates that it is an error only for psychologists who work from the introspective point of view, the argument of this paper is that the error is much more far-reaching and is one that interferes with accuracy of scientific prediction whether the problem is couched in terms of behavior or in terms of the psychology of introspection.

The nature of the equivocal correlation that may result from judgment of stimulus is best illustrated by the facts of the cutaneous linen of duality. Here, avoiding any stand upon the issue of parallelism or interactionism, we may nevertheless assume that we are dealing with a dependent series that involves a stimulus, an excitation, a perceptual pattern (Henri, Gates, etc.), and a report. The dependence of excitation upon stimulus is a function of the mode of stimulation and would ordinarily be controlled in any careful psychological experiment. The perceptual pattern issues from excitation under the laws of attention and cannot be univocally determined unless attention is controlled. The report issues from the perceptual pattern in accordance with the particular criteria that have been established and varies with the attitude of the subject (Titchener, de Laski, Friedline). The technique for the control of attention and of attitude, which was first developed in introspective laboratories, constitutes a mode of control for these intermediate variables and is the only method at present available for achieving precise prediction of response on the basis of stimulation. To avoid their control and to seek to condition response solely upon stimulation is to deal in uncertain relationships and to make the stimulus-error.

Experimental Determination of the Nature of Inhibition in Human Nervous System. RAYMOND DODGE, Wesleyan University.

Admitting the probability of inhibition in mental processes, its

actual conditions in human nervous systems are of both theoretical and practical importance. Excluding the supposition of specific inhibitory processes, for which there seems to be no physiological evidence, there are two outstanding hypotheses that challenge experimental verification, the Verworn refractory phase theory, and the McDougal drainage theory. Available techniques for studying the reflexes seemed to offer conditions for crucial experiments. They indicate that both forms of inhibition are actually found in human nervous system. In this case the real problems are to trace the operations of these different processes instead of confusing them under a common concept.

EXPERIMENTAL PSYCHOLOGY

The Pitch Range Audiometer. CORDIA C. BUNCH, University of Iowa. (Introduced by C. E. Seashore).

This audiometer makes it possible to measure quickly and accurately the acuity of hearing pure tones in a continuous series from 30 d. v. to 15,000 d.v. The instrument consists of an alternating current generator with its variable speed driving motor, a telephone, and a potentiometer for varying the current through the telephone.

Records of both normal and pathological cases are shown the fields of hearing for certain lesions are found to be typical and of service for differential diagnosis in otology. Certain principles of hearing have been demonstrated with this instrument. For practical work in the otological laboratory this audiometer makes it possible to make the hearing test in less than one-tenth of the time required with the Bezold Continuous Tone Series and the record is continuous for all tones instead of being given for the pitch of certain forks.

Determination of Relative Liminal Intensities for Sounds of Different Pitch. MARTHA GUERNSEY, University of Michigan. (Introduced by W. B. Pillsbury).

It is one function of this investigation to make a large number of direct, quantitative measurements of minimal sound intensities at different vibration rates, in order to approach a determination of absolute intensities for the average human ear. A second part of the experiment was devoted to testing the validity of Weber's Law in the field of audition.

Our apparatus makes use of vacuum tube oscillation, and comprises essentially the same electrical phenomena as those employed in ordinary radio phenomena. A circuit containing variable capacity and self-inductance is started into oscillation by the mutual inductance of two coils. Tuning is accomplished by varying the capacity. The tones are measured by comparison with Edelman tuning forks. After several measurements, the inductance may be determined from the formula $T = 2\pi\sqrt{LC}$, and for the upper limits the pitches may be obtained from the known capacity and inductance.

So far, the determinations quantitatively worked out make the amount of energy in ergs required for a liminal tone of 120 vibrations slightly less than Wien's results. Our results also show differences in sensitivity for different pitches. Tones of the upper middle range are more easily perceived than tones either below or above it, when unit energy is used as a common stimulus.

For the pitches hitherto studied, Weber's Law seems to apply, within limits. The fraction is roughly constant, and resolves into an average of one third. It is smaller near the limen and increases toward the upper limit of intensity.

The Distribution of Effort in Memorizing And Its Effect upon Retention. EDWARD S. ROBINSON, University of Chicago.

Two experiments were performed. In the first a list of 10 three-place numbers was presented either 12 times at a single sitting or 6 times at one sitting and 6 times 24 hours later. The relative efficiency of the two methods was tested by written recall 5 minutes, 20 minutes, or 24 hours after the completion of study. Distributed effort proved to be better than concentrated, and this superiority was slightly clearer after 24 hours than it was after 5 minutes or 20 minutes.

In the second experiment a list of 10 three-place numbers was presented either 6 times at a single sitting or 3 times at one sitting and 3 times 24 hours later. Again the relative efficiency of the two methods was tested by recall 5 minutes, 20 minutes, or 24 hours after the completion of study. At 5 minutes after study concentrated effort was superior to distributed. This condition changed, however, with the progress of forgetting. At 20 minutes after study recall was slightly in favor of distributed effort, and after 24 hours the advantage of distribution was unmistakable.

The results of these experiments suggest that the relative merits

of concentrated and distributed effort depend upon: (1) the total effort expended, (2) the units into which that effort is divided, and (3) the stage in the forgetting process at which memorial efficiency is tested. The second of these factors might also be stated in terms of the degree of learning involved. That is, interruption of study may vary in its effects according to the point in the learning process at which it is introduced.

The Flashing of Fireflies: A Study in Visual Rhythm. CHRISTIAN A. RUCKMICK, University of Illinois.

For a number of years a considerable amount of discussion has been published concerning the appearance of supposedly synchronous flashing of fireflies and the "rhythmical" behavior of other animal forms. The synchronism has been positively affirmed by some observers and as stoutly denied by others. Interpretations have been proposed in regard to the alleged occurrence and these are usually influenced by biological, chemical, and psychological considerations.

Although, as suggested, a psychological explanation has already been offered, there has been no experimentation on the subject and consequently no verification of the mental factors presumably involved. With the help of several student collaborators the writer has investigated the problem for the last few years and has duplicated the primary conditions of the phenomenon in the laboratory. Apparatus was devised to give variable series of flashes, twenty in number, in an irregular pattern on the wall of a dark room in which the observers were seated one at a time. The observers represented several degrees of training in psychological experimentation and, except for some control series, were ignorant of the purpose or nature of the investigation. That the effect was comparable to that of the flashing of fireflies was discovered from the unsolicited statements of the observers. Later series were added to give more nearly the correct flashing time and intervals as obtained from investigations recently published by the Snyders. This semester movement of flashes was reproduced by rotation of the framework on which the lights were mounted.

In all of the reports there was indubitable evidence that organization of the flashes, even when not physically synchronized, is the rule rather than the exception. Just as we tend to group sounds into rhythmical patterns when, as for example, we hear a dozen clocks ticking at different rates, so we group visual presentations

into spatial and temporal patterns. This tendency is more readily and more speedily set off when the presentations are at first physically grouped in the series as when a few flashes are actually made to coincide temporally.

The application of these results to the fireflies would seem to indicate that there may be for a short time a synchronism of many flashes in a group due to conditions of temperature and moisture, but that the continuous flashing in such manner, the regularity of it, and the uniformity of it throughout the group of fireflies, are matters of mental rather than of biological interpretation.

Reaction-Time as an Index of the Dependence of Visual Performance on Variable Conditions of Observation. H. M. JOHNSON, The B. F. Goodrich Company.

As compared with determination of sensory thresholds, measurement of the rate of learning or of variable productivity, the measurement of reaction-times has been little used in recent investigation. However, the time required for a stimulus to become effective is a cardinal factor in the relation between stimulus and response, It is also an exceedingly sensitive indicator of the effects of differential conditions of observation. Its sensitiveness necessitates the use of certain precautions which have been neglected by some students, and which by an appearance of complexity have deterred others from using the method.

This report shows graphically the distribution of some 30,000 reaction-times according to days of practice in two kinds of visual observation. The measurements tend to concentrate about several widely separated and stable modes. At first the preference is for modes representing the larger values. The effect of learning is represented, not by gradual shifting of the values of the modes, but by increasing concentration about shorter ones definitely present from the first; and by gradual disappearance of the longer ones as training approximates completion.

The statistical reliability of such differences as are found depends on the ratios between their magnitudes and their probable errors. It is quite practicable to make as many as 400 measurements in an hour. Thus it is feasible to attain any desired standard of statistical certainty by simply making the required number of measurements. The labor required is much less than in other types of study.

The probability of an observed difference being due to chance may be reduced to an infinitesimal value before enough measure-

ments have been taken to distribute the effects of *intra-serial* practice and fatigue equitably among the compared variables.

The sensitiveness of these measurements surpasses that of threshold-determinations made in the ordinary way. If the duration of the stimulus is made an essential variable, as Cobb has suggested and done, the advantage of reaction-time measurement is diminished. The relative convenience and usefulness of the two methods then depends largely on the magnitude of the investigation.

Monocular and Binocular Perception of Brightness. PRENTICE REEVES, Eastman Kodak Company.

Many of the experimental determinations of the least perceptible brightness and the least perceptible difference in brightness have, through necessity, been made monocularly. In many of the practical problems where such data may be applied, however, the working conditions usually involve binocular vision. The results in the literature are discordant and are more qualitative than quantitative. This paper is a preliminary report of results obtained from a practiced observer, the writer, in monocular and binocular perception of brightness and brightness differences. It is primarily a quantitative determination.

The results were obtained with an improved visual sensitometer and the procedure was the same as in previous experiments with this apparatus. The eyes were fully adapted to darkness, 0.1 millilambert or 1.0 millilambert and the stimulus exposed for a small fraction of a second, 1, 2, and 5 seconds. The effect of the previous condition of the retina was also studied.

The conditions of the experiment are such that stereoscopic differences are reduced to a minimum. The results show a greater sensibility to brightness and brightness differences for binocular than for monocular observations. The difference between the two observations varies with different conditions of retinal adaptation and shows clearly that more results are necessary before definite conclusions can be made.

In monocular observations the unused eye was covered so that a marked difference in adaptation conditions existed. The next step in the experiment will be to determine the effect of exposing both eyes to the same brightness in monocular as well as binocular observations. The experiment is to be repeated for adaptation to higher brightnesses and results are now being secured from several

observers of varying amounts of experience in photometric observations. The effect of exposing both eyes to a field of non-uniform brightness is also proposed.

Light-Spot Adaptation. KNIGHT DUNLAP, The Johns Hopkins University.

In earlier work (Dunlap, *Arch. f. Psychol.*, 1912, 24, 299-304) I found that with oblique vision of a light spot (small luminous area) in a darkened room, the spot disappeared in a few seconds, if eye-movement did not intervene, eye-movement having a definite restorative effect on sensitivity.

In recent work in the Nela Research Laboratory, I found that when the stimulation of an extra-central area in one eye was continued for a sufficient number of seconds beyond the time at which the lightspot disappeared, the corresponding area in the other eye, previously unstimulated, was inhibited, *i.e.*, blinded.

The fact of a central inhibition (adaptation?) is thus demonstrated, as well as the fact that light, although invisible, may produce a definite effect on the nervous system.

This paper will appear in the *Amerian Journal of Physiology*.

The Registration of Compensatory Eye-Movements. RAYMOND DODGE, Wesleyan University.

Exact knowledge of the eye-movements and their rôle in vision has been materially increased by photographic registration. All traditional techniques of this sort require open eyes, and at least one brilliantly illuminated point in the visual field. True reactive compensatory eye-movements in response to stimulation of the semi-circular canals, and other movements of normal non-seeing eyes have never been adequately recorded, and in consequence are very imperfectly known.

The eccentrically placed cornea, which is commonly exploited in direct photography may be made to activate a small recording mirror which rests on the closed eyelid. Such a mirror will tend to assume positions tangential to the underlying globe. If it rests on the cornea it will deflect a pencil of light in a direction opposite to that of the moving eye. While not adapted to record accurately the successive fixation points, it will give reliable data on the beginning, duration, and direction of eye-movements and will roughly indicate their relative extent. It may be used for class demonstration of reading and other eye-movements if one eye may be kept closed.

The Influence of Varying Amounts of Initial Visual Control in Maze Learning. HARVEY A. CARR, University of Chicago.

A stylus maze was so constructed that the cul-de-sacs and the correct path can not be distinguished by means of vision. A group of human subjects was permitted the use of vision during the first trial, and was then compelled to complete the mastery of the maze without the aid of sight. A second group was permitted the use of vision during the first two trials, another during the initial three trials, and a fourth for five trials. These results are compared with those of a fifth group that mastered the maze entirely without the aid of sight.

The introduction of vision during the first or the first two trials is without effect upon the number of trials necessary to learn the problem, but in both cases it does decrease very materially the number of errors made while vision is used as well as during the subsequent period of mastery.

Visual control during either the initial three or five trials decreases the number of trials by 45 per cent.; these amounts of control are very much more effective upon the average number of errors per trial in the period subsequent to vision than is any lesser amount of control.

The results indicate that this visual perceptual control is effective upon the time of learning only when the maze is practically mastered in visual terms. Of the first two groups only one of the twenty-four subjects obtained a visual mastery of the problem, while in the last two groups eighteen of the twenty-three subjects had the maze learned in visual terms at the end of the third trial.

The Effect of Varying Amounts of Initial Guidance of Maze Learning. KATHERINE E. LUDGATE, University of Chicago.

Six groups of 15 subjects each learned a stylus maze. In five groups the Experimenter controlled the initial trials by grasping the base of the stylus and guiding the subject's hand over the correct pathway, thus preventing any errors. Group (1) was given this control the first 2 trials, group (2) the first 4 trials, group (3) the first 8, group (4) the first 12, and group (5) the first 16 trials. They then completed the learning without aid. Their records were compared with group (6) which learned without guidance.

The results indicate that there is a marked saving in average total trials only in the group with 2 controls, those with 4, 8, and 12 controls approximating the record of the uncontrolled group,

and those with 16 controls exceeding it. There is a large saving in total errors (retracings and cul-de-sacs) in all controlled groups.

Sex Differences in a Case of Trial and Error Learning. GEO. S. SNODDY, University of Utah.

In a previous study (*Psychol. Mono.*, 1920, 28, No. 124) the writer has made an analysis of the learning to trace by mirror reflection the path of a star diagram cut from brass. In this study it was shown that the improvement in the early stages of the learning was dependent upon the resolution of a zig-zag, of back and forth course of the stylus into a straight or smooth course of the stylus down the middle of the path. This resolution of the zig-zag course of the stylus into a straight one was shown to be dependent wholly upon the interposition of time intervals between successive circuits. Improvement in the more highly practiced learners, in later stages of the learning curve, was shown to depend in part upon the elimination of the time intervals between circuits, or series practice. Since early learning is dependent upon insertion of time intervals and consists of the resolution of a zig-zag movement into a straight away movement, this was interpreted to mean that this improvement, adaptation, depends upon a simultaneous irradiation of the nerve impulse to the lateral musculature of the tracing arm.

When the data of this experiment are examined for sex differences some remarkable results are found. These may be summarized as follows: (1) Among university students the efficiency of the men at various stages of the learning curve is seventy-five per cent. of that of the women. (2) Only one man in eight reaches the average of the women. (3) The deviation of the male average from the female average shows slight though apparently significant variations at certain stages of the learning curve. (4) A study of public school children below 12 shows boys and girls very similar, with boys slightly more efficient. (5) A study of junior high school students of 15 years shows the same percentage relations as obtained among college men and women. (6) If college women are in a state of excitement from instructions, dosage of caffeine or thyroid glands, of toxic goiter, their records and behavior closely approximate those of the males. (7) From the above the conclusion is reached that puberty for the male means an increase in the irritability of the cortical centers which lowers the rate of adaptability in the learning functions involved in mirror tracing.

Interference Effects in Series of Habits. J. F. DASHIELL, University of North Carolina.

In the case of habits that contain enough identical and enough dissimilar elements interference effects are well known to be produced when the subject leaves off one and starts practice on another. A question that arises is: In case a subject practices successively upon a series of such identical dissimilar habits, will the interference effect observable in a change from a first to a second habit reappear in equal or in different degree in each following shift from habit to habit? The question was attacked by having subjects learn series of habits chosen among different kinds of materials (card sorting, pencil mazes, and substitutions). In some cases the interference effect did not reappear, in some cases it did. Analysis of factors bearing on these results is then attempted.

The Shortening of the Trial and Error Series into Simple Habits. STEVENSON SMITH, University of Washington.

Although some series of trial and error responses may *in their entirety* become chain reaction habits, others, such as the series of puzzle-box responses, are shortened in the process of habit formation. Often all but the essential response is finally eliminated. This process of shortening may be described in the following way.

Most stimuli which when weak cause an approach response, cause avoidance when they become very intense. The less remote an object is, the more intense is its stimulation. Thus approach to an object may cause an intensity of stimulation which then results in avoidance.

Approaching an object may cause the stimulation of sense organs not at first affected. Thus *a single object* may be the source of approach stimuli to distance receptors, and later the source of avoidance stimuli to cutaneous receptors and proprioceptors. When an object is first approached and then avoided, the approach stimulus is still operating while the avoidance reaction is being given. Thus avoidance tends to become a conditioned response to the approach stimulus. The approach stimulus then arouses two incompatible responses of approach and of avoidance. This may be an incompatibility of integration or of orientation. Such ambivalence makes a compromise response impossible. The instinctive emotional reinforcement to avoidance is usually much greater than that attaching to approach responses, so that, in the rivalry of approach and avoidance, avoidance is likely to prevail. An

exception to this rule is found in mating and in food getting responses, where approach often has the greater reinforcement.

The animal in the puzzle box thus develops conditioned avoidance responses to all the rigid confining surfaces, as avoidance is caused by resistance to his manipulation. He does not learn to avoid the movable door-opening device, as this, unlike all other parts of the box, affords no avoidance stimulus. Although the animal turns away from the door-opening device in response to the open door, he does so not because the opening device repels him but because the open door attracts him. Approaching the opening device and approaching the open door are finally the only approach responses which are uninhibited by conditioned avoidance responses, and while the door is closed the opening device alone calls forth an uninhibited approach.

Some Experiments on Learning. JOHN F. SHEPARD, University of Michigan.

This is a brief preliminary report on work now in progress. The animal maze used is constructed as follows. A solid wood floor is mounted on a heavy frame which in turn is mounted on rollers. In the floor are set square posts 14" high and 12" o.c. in both directions. In each side of the posts is a vertical groove into which are fitted five-ply veneer pieces. The floor is covered by a waterproof flooring, 12" X 12" units, with cutouts at the corners for the posts. The whole arrangement is fifteen units square and is covered by removable $\frac{1}{2}$ " mesh wire screen. Any maze which can be drawn within these limits can, therefore, be set up.

In the recent work, one group of animals has been used in a series of mazes as follows: three mazes were learned in which the different sections of true path (eleven in each maze) were unique. After each maze, the animal learned modified forms of the original, involving changes of from one to three sections. The specific error introduced was generally eliminated quickly, but might recur on succeeding days, and nearly always led to other errors, especially those preceding the changed portions, and those introduced by previous changes. A maze was used in which the sections of true path were alike kinæsthetically, somewhat different visually. This proved nearly or quite impossible for the animal to learn. There were also learned in order a maze in which the culs-de-sac were replaced by traps having no blind ends but returning on themselves; a maze in which there were no true paths and blinds, but

only short and long sections connecting two successive points; a maze in which all junctions are cross-roads, the right or the left as the animal approaches being true path and the left or the right connecting through various turns to the path directly ahead. In these mazes the backward order of dropping errors was much more evident than in the earlier types.

Humans have been used in maze apparatus more nearly duplicating the animal conditions with results much different from those with the usual pencil maze. The errors are eliminated more systematically according to order, and introspections on adapting to changes are in terms of the maze rather than absolute position.

Massed vs. Distributed Effort in Learning. L. A. PECHSTEIN,
University of Rochester.

Groups of college students and white rats were taught mazes under conditions highly comparable. Short and long mazes were utilized, it being found possible to secure satisfactory learning from the animal groups with distributing the practice. The following conclusions may be drawn:

1. For a new, short run, massed effort is preferable.
2. For subsequently learned short runs (allowing transfer possibilities), massed effort continues preferable.
3. In connecting short maze patterns learned as separate units, this complex act of connection is not only possible in a massed program but is accomplished with very great economy, just so long as the units have been learned as massed effort problems.
4. The longer the problem, the more necessary to break it up into units and learn each unit and to mass the learning upon each unit, it being uneconomical either to mass the effort in learning the long problem or to distribute it.
5. It is clear that the question of massed vs. distributed learning is tied up with the question of whether the difficult problem is to be learned as a whole or in parts.
6. Results hold for motor learning of the maze type and for both animals and humans.

Learning when Frequency and Recency Factors are Negative. JOSEPH PETERSON, George Peabody College for Teachers.

Frequency factors seem to be alone responsible for the backward elimination of errors in the maze. This is shown most clearly in

mental maze experiments which eliminate the influence of disturbing spatial factors. The probability of one's getting successfully past a blind is greater near the goal (food box, in animal mazes) than near the entrance, and the learning coefficient constantly increases from the entrance-end toward the goal-end of the maze. This advantage for learning to eliminate entrances to blinds in the latter part of the maze is traceable to the fact that in each trial the forward runs will exceed the backward runs by one; $f - 1 = b$, where f is for the forward and b is for the backward runs.

It has been found possible in the present study to present to the human subject in the mental maze, a situation which entirely eliminates the positive effects of frequency and recency factors in learning, and to obtain a full record of all subject's responses under conditions affording a quantitative treatment of results. The method is the same as that published in the *Journal of Experimental Psychology*, 1920, 3, 257-280, with the exception that on each wrong choice the subject is immediately brought back to the entrance, and again given the alternative choices at the first blind. In such a situation the chances each time of getting successfully past the several blinds in order from the first to the tenth are $1/2$, $1/4$, $1/8$, $1/16$, $1/32$, $1/64$, $1/128$, $1/256$, $1/512$, and $1/1024$, respectively. The chance of getting to the goal in any one trial (that is, without an error) is 1 to 1,024.

Results clearly indicate recency and frequency effects, but they are negative and tend to fix errors and thus to obstruct learning. Errors are eliminated in the forward instead of in the backward direction, and the errors in the goal-end of the maze exceed, and those in the entrance-end fall short of expectations on chance laws. In this case learning seems to be based upon, and indeed is possible only by the overlapping of the effects of successive stimuli, in accordance with the principle of "completeness of response." The neural basis of such cumulative effects of stimuli is not yet known, but a suggestion is made for a neurone action theory that is susceptible of mathematical treatment.

INTELLIGENCE TESTS AND CLINICAL PSYCHOLOGY

The Services of the Clinical Psychologist. G. W. A. LUCKEY.

Clinical psychology is but a branch of psychology, as psychology in turn is but a branch of science, and science but a branch of the larger field of human experience. Any grouping of the men of science leaves without the fold a much larger group of scholars still

unclassified. But human interests are closely related to and affected by all.

In the evolution of any subject of human learning, its helpfulness and dangers tend to increase in geometric ratio. Hence, "Drink deep, or taste not the Pierian spring." There is a growing, pernicious tendency in education to narrow, differentiate and isolate subject-matter from its fountain source, under the mistaken idea of simplification and of short-circuiting the natural processes of education. It is here especially, that "a little learning is a dangerous thing." Our efforts in behalf of universal education (a necessity in an efficient democracy) are filling places of great responsibility with uncultured brains of small caliber, a danger that might be avoided through better understanding of education and saner methods of teaching.

Civilization is passing through an epoch-making period. The destruction and after effects of war, always create soul-racking disturbances, unbalancing weak and undisciplined minds. Such periods call for all that is good and true in heart and mind to stem the tide of evil. It becomes necessary to take an inventory of stock and to do some quick adjusting in order to prevent national and international calamities. Small minds lack vision, become lost in details, and can not sense the fundamentals that lead to higher levels. It behooves the scholar to keep his bearing and hold his light that it may be seen.

The two most promising fields open at present for the services of the clinical psychologist are, in my judgment, the elementary schools and the juvenile court. No child should pass through either without receiving a careful physical and mental examination by the best of experts. Every correction possible to human betterment should be discovered and righted. Intelligence scales should be perfected. Better standards of living and doing should be set up. The moral ideas of the people should be aroused and strengthened. We should increase our knowledge of the organic weaknesses and mental defects of the children, including the causes and the remedies. Finally in the scientific reconstruction of education that must follow as a result of the war, the clinical psychologist must lead the way in setting up right ideals and standards of education, and in presenting the truth with sufficient clearness to be catching and impelling.

Mental Measurements of Undernourished Children. BUFORD JOHNSON, The Johns Hopkins University.

The total number of entrants to the first grade classes of a public school in New York City were measured for selection of the undernourished. Out of the group of one hundred and twenty-six boys, forty were found from 8 to 20 per cent. underweight, with an average of 11.6 per cent. These were segregated into one class for study. A Control Group was formed of forty-one boys nearest the normal standard, with an average percentage overweight of 0.83. The following tests were given to both groups: card sorting, cancellation, controlled association, and cylinder.

Scores in the Stanford Revision of the Binet-Simon Tests and in the Haggerty Mental Examinations, together with Teacher's ratings, were secured. Seven in the Nutrition Group are below normal in intelligence, and two are borderline cases. Eight in the Control Group are below normal and three are borderline cases. When group averages are considered, all three measurements are favorable to the Nutrition Group.

The Nutrition Group was also given the following tests: tapping, steadiness, target, substitution, picture completion. Where norms are established, the scores for the undernourished children, if the mental defectives are eliminated, fall within the normal range. Those of firm muscle tone and without hyperactive reflexes make better averages in total output in tapping tests than those defective in these respects.

The comparison of the gains in weight during the period of the Nutrition experiment made by those having high intelligence scores, and those of low intelligence quotients, shows a significant difference in favor of the more intelligent.

The curves of growth suggest that a percentage of 8 or 9 per cent. underweight by present standards does not materially affect the normal growth of a child in weight; a percentage of 10 or more involves less absolute gain and less than the expected normal gain. A marked seasonal variation is also indicated.

Other conditions being equal, especially the levels of intelligence, children from 8 to 20 per cent. underweight compare favorably with other children in mental traits.

Interest Psychographs. J. B. MINER, Carnegie Institute of Technology.

A method for describing by contrasts the interests of an indi-

vidual is set forth. It was developed from a suggestion of Dean Herman Schneider of the University of Cincinnati Engineering College. The method has been tried with high school pupils and college freshmen. Standard psychographs for the sexes and for those in different types of courses are shown. They point to a plan for guiding young people into that work in which they will find the nearest approach to their own distribution of interests. To reduce the waste of human energy from misdirected effort to vocational lines which do not call forth the individual's fundamental drives is the main aim.

Report on Series of New Learning Tests. AUGUSTA F. BRONNER,
Judge Baker Foundation.

Careful estimation of capacities necessarily involves estimation of learning ability. Heretofore no experimental data has been published on the extent to which performance on age-level and other tests indicates learning ability for ordinary subjects. We find great individual differences. Practically all investigations of learning have been concerned with acquirement of motor skill. We need more light on learning capacity for school subjects and along vocational and cultural lines. Attempting to supply the need we have devised a set of learning tests for four different types of learning:

(A) Forming associations between two visual percepts, an improved substitution test.

(B) Associations between a visual and an auditory percept.

(C) Associations between visual percept and idea of numerical value.

(D) With logical material, association of complex visual percept with a series of ideas. Description of the tests, tentative method of scoring, and some indication of norms.

The Clinical Significance of the Kent-Rosanoff Association Tests.

FLORENCE MATEER, Assisted by FLORENCE FITZGERALD, and
MARGARET DAVISON, Ohio Bureau of Juvenile Research.

The association test has undergone manifold experimental modifications and usages but the general opinion in psychological fields today is that its clinical usage is a hazardous and little worth while proceeding, since the variability of normal individuals is so great that only the exceptional clinic patient lies outside the normal range of variability in his reactions. This is undoubtedly true if an attempt is made to study an individual by means of the associa-

tion test alone. The value of the test lies in its correlative use with other standardized tests. There are qualitative, as well as quantitative differences which reveal themselves only when the most detailed analyses are attempted.

The Bureau of Juvenile Research has found the usage of the Kent-Rosanoff association test well-repaying the time spent on it. Even though the norms available for the study of frequency of common associations are imperfect, they give a basis from which standard deviations may be calculated and variabilities evaluated.

The test shows definite variations in reactions of individuals of different mental levels, hence it must have new norms established in relation to mental age. In general, the higher the mental level the fewer the common associations and the more frequent the individual associations. These frequencies may be easily graphed.

The individual associations are more frequent in a psychopath than in a normal person of the same mental level. The difference in the individual reactions of the two is easily ascertained by a qualitative analysis for neologisms, perseverations, sound associations, automatisms and other aberrant types of functioning. The individual reactions of the normal person may easily be analyzed into logical associations portraying much of his individuality, professional interest, etc.

The highest clinical value derived from the use of the association test comes from the repeated observation of the patient day by day. The association test gives the first indications of improvement or impairment. It takes only a few days in most cases to determine whether there is a variability of the psychopathy or a more or less persistent stability of abnormality. One can understand better fugues, depressed phases, excited spells, and other abnormal episodes by use of the association series.

A Comparison of Three Methods for Making the Initial Selection of Presumptive Mental Defectives. J. E. WALLACE WALLIN, Psycho-Educational Clinic and Special Schools, St. Louis.

Since the special schools for mental defectives were organized in St. Louis in January, 1908, the following methods of making initial selection of cases has been tried: (1) initiation of examinations left entirely with the individual schools; (2) selection by the psycho-educational clinic from preliminary reports made by the elementary schools (being compulsory for all schools) twice annually on a prepared form (13-H) of children judged to be most deficient mentally;

and (3) selection of pupils making the lowest scores in a group intelligence test (Pressey Primer).

The second method has proved decidedly more effective than the first, and somewhat more effective than the third in routing out the lowest grades. The average Stanford-Binet I.Q. was .69 for the 13-H selections compared with .72 for the lowest-score cases in the group test. While the correlation between the scores in the group intelligence test and the individual intelligence test was high, .73, the results were quite discrepant in a considerable number of cases.

Group intelligence tests are of considerable value as *one* item in pedagogical and social classifications, but they do not enable us to dispense with the child's pedagogical record, nor with the necessity of making individual diagnoses (particularly the analyses based on a psychoclinical examination), nor do they enable us to classify and promote children irrespective of their specific intellectual and pedagogical disabilities and abilities.

The conclusion that it was possible to select the lowest-grade pupils for examination from reports made by teachers and principals in conformity with prepared instructions, just as effectively, if not more effectively, than could be done by means of group intelligence tests might not apply to school systems with an inexperienced, poorly trained, and unintelligent teaching staff.

The Sub-Normal Mind versus the Abnormal. HENRY H. GODDARD,
Bureau of Juvenile Research, Columbus, Ohio.

Up to the present time there has been little or no consistency in use of the terms abnormal and subnormal. Have we not progressed far enough in our knowledge of the conditions connoted by these terms to consistently distinguish between the two. It has been somewhat customary to represent the range of human intelligence by a line curving upward; the length of the line and its height representing the entire range from infancy to genius, and to consider that for adults there is a more or less definite point, sometimes fixed at twelve years, below which a person is said to be subnormal.

But we must remember that mind may be "away from" the norm as well as "below" it. An analysis of the results of mental tests shows that a mind may be of normal level but abnormal in its functioning. Hence it seems that our line should become an upward sloping band or ribbon, one edge of which, above a certain

point, represents normality, while the rest of the ribbon represents greater or less abnormality. But however we may represent it, it is now clear that there is a very definite distinction between mental level and mental functioning. The child whose mind does not function normally we call psychopathic or abnormal. It is the result of disease and the disease may have become so serious that we have as a result not only abnormality but subnormality due to deterioration.

Various curves developed from the study of the feeble-minded could not be made to adjust themselves to the theoretical curve. It is now clear that this was due to the inclusion, among the cases studied, of a group of psychopaths.

The whole matter of the I.Q. for instance, becomes of no significance, because a person may be psychopathic or abnormal with an I.Q. of 100 or of 140 as well as one with an I.Q. of 75 or 50.

For the future it is of course clear that in making our studies we must be careful to have homogeneous groups; that in working with problems of intelligence we must lay greater stress on the qualitative work than on quantitative. In other words we have apparently come to the point in our study of this problem where progress is to be expected along the lines of abnormal functioning quite as much as, if not more than, along the developmental lines.

The Will-Profile of Psychotic and Psychopathic Subjects. JUNE E. DOWNEY, University of Wyoming.

Will-Profiles have been plotted for a few groups of psychotic and psychopathic subjects in order to determine the presence of specific characteristic reactions or of any type-patterns for the Will-Temperament scale as a whole. The subjects were patients in the Boston Psychopathic Hospital. Only those cases are utilized in the diagnosis of which the staff were agreed.

As compared with the profile of the normal adult, the profiles in the collection under consideration are characterized by great inequalities in scores, high at some points, vanishing at others.

With reference to special groups, dementia precox patients give a profile showing great retardation in speed and excessive load, with little power of inhibition or of coördination. At the center, the graph has a high peak for such traits as motor impulsiveness and reaction to contradiction. It is difficult to get dementia precox subjects to react at the signal; they retouch their writing frequently and may react with suspicion to the contradiction test.

Manics, after recovery from an acute attack, run high on the aggressive traits, excessively so on motor impulsion. The graph dips at both ends, but not to the degree found in dementia precox patients. There are premature reactions to signals and, in the passing of character-judgments on self, a loss of time through unnecessary and, frequently, irrelevant comments.

Patients in the depressed phase of manic-depressive insanity give very low scores for speed of movement and of decision, and in the case of the latter test exhibit a maximum of emotional blocking. Such subjects showed very great interest in detail and more capacity for inhibition than was evident for any other group. They were dissatisfied with their performances. The most characteristic record, however, is the low score on motor impulsion where they exhibit writing diminished in size in comparison with their normal and in contrast to the extraordinary magnification found in the manic.

Psychopathic personalities give one of two pictures, either a uniformly low record throughout; or an emphasis of speed, lack of load, and high motor impulsion, with a total collapse of the graph on such traits as motor inhibition, coördination of impulses, interest in detail, and flexibility.

Method of Study. A. S. EDWARDS, University of Georgia.

Examinations of the ability of students to tell how to study reveal a poverty-stricken condition in this respect. In most classes in the city schools of Athens, Ga., there is progressively more known by the higher grade pupils, but in most cases the information given rises very little above zero and in many cases is zero. In a few classes in which teachers have definitely taught pupils how to study, the results are obvious and information clearly superior. In the practise school of the State Normal School (Athens, Ga.) the pupils show knowledge of how to study superior to that of the city school pupils and clearly indicate results of having been taught how to study. A careful examination of papers written by Normal School seniors shows a fair knowledge of facts about how to study in the case of part of the class, but entire lack of judgment as to what can be taught to elementary school pupils about how to study; their written plans for teaching children how to study show that they would attempt to teach as much to first grade as to sixth grade pupils. Whereas, teaching how to study must for many years if not forever, be emphasized in the high

school and college, experiments have shown successful teaching of how to study in the elementary grades. Two of the most urgent problems connected with studying are, first, the preparation of teachers to teach how to study; second, the formulation of tests, not only of knowledge of how to study, but of performance in studying.

The Correlation between College Grades and the Army Alpha Intelligence Tests. J. W. BRIDGES, Ohio State University.

In October, 1919, the Army Alpha Test was administered to five thousand nine hundred and fifty students at the Ohio State University. The correlations here reported are based on the college grades and intelligence scores made by students selected at random from this group. Correlations between academic grades and the total Alpha scores and between academic grades and the scores on each of the sub-tests were calculated. This was also done separately for students of different college ranks; seniors, juniors, and sophomores; and for students registered in different colleges of the university. Arts, Education, Engineering, and Agriculture.

The correlations between grades and total Alpha scores vary from .54 in the college of agriculture to .22 in the College of Engineering with an average of .36. The correlations in the case of the subtests are in general lowest for tests 1 (directions) and 3 (practical judgment), and highest for tests 4 (synonym-antonym) and 8 (information). There are, however, marked variations in the different colleges. For example, in the college of arts the correlations are highest in the case of tests 4 and 5 (disarranged sentences) and lowest in the case of tests 2 (arithmetic) and 6 (number series completion); while in the college of engineering the correlations are highest in the case of tests 2 and 6, and lowest in the case of test 4.

These results seem to indicate that intelligence tests for university students should be selected and standardized for the different colleges separately, or that in addition to a general intelligence test for all students there should be specific tests for the students of the different colleges.

Intelligence of 6188 High School Seniors Going to College. WILLIAM F. BOOK, Indiana University.

In May, 1919, the senior classes in 320 commissioned high schools of Indiana were given the Indiana University Group Intelligence tests. The chief purpose of the investigation was

to locate the brightest seniors graduating from the high schools of the state, and to make arrangements whereby the most superior individuals might be encouraged to continue their education in college. But besides the intelligence scores so obtained the following additional information was secured from the high school principals and teachers, and the pupils taking the tests: (1) age at time of graduation, (2) number of semesters spent in completing a four year's high school course, (3) their exact college intention, (4) yearly income of father, (5) father's occupation, (6) student's favorite study in high school, (7) choice of a life occupation, (8) scholastic standing in each subject studied in his junior year, etc.

The following facts are revealed by these comparisons:

1. High-school seniors with all grades of intelligence possessed by high-school seniors are going to college in about equal numbers. Almost as many seniors rated E or F are going to college as merit intelligence ratings of A+ or A.

2. Many of the brightest seniors graduating from our high schools are not planning to go to college at all. Of those rated A+ 22 per cent. stated that they never expected to go to college; of those rated A 24 per cent.; of those rated B 28 per cent. Many students, on the other hand, with the lowest grades of intelligence found among high school seniors are definitely planning to go to college, and have all arrangements made to attend. Of those ranking D, E, and F on our tests (the most inferior seniors in the state) 64, 62 and 70 per cent. respectively stated that they would attend college next year.

3. Taken as a whole the students who have decided to go to college rank slightly higher on the intelligence tests than those who have not. Those who have selected the college they will attend rank higher than those who have not decided. Those rated A+, A and B are slightly more likely to attend college than those whose test score placed them in the middle or lower sectors of the distribution.

4. The brightest seniors in the state, *i.e.*, those rated A+ or A selected a college of liberal arts, while more seniors rated C+ and C selected a professional or technical school.

5. For every grade or level of intelligence the boys ranked higher than the girls. The higher the grade of intelligence the greater is the percentage of boys.

A Scale for Investigating Graduation Standards from Junior High School. SIDNEY L. PRESSEY, University of Indiana.

The scale is intended as a first step in the direction of an examination for standardizing graduation requirements for the junior high school. As such, the plan involves certain unusual features of method: (a) no use is made of the "normal curve"—instead a bi-modal distribution of failures and successes is being sought, (b) items are being chosen with reference to their differential value rather than to their position on a "scale," and (c) the "efficiency" of the examination will be determined in terms of its ability to distinguish those who actually are failed from those who are graduated, in standard schools.

The scale in its present form is essentially a preliminary investigatory instrument. It consists of a four-page folder, giving tests in history, reading vocabulary, English composition, and arithmetical reasoning. The history test is informational; the arithmetic test is so planned that problem-solving, as distinct from ability in the fundamentals, is involved. The important feature of the scale appears in the handling of the problem of measurement in English.

Critical investigation of "silent reading ability" led to exclusion of any test aiming to measure such a hypothetical factor (reported by Mrs. Pressey). It was found that ratings by means of a composition scale (Willing scale) were much more unreliable than is usually supposed, because of the unreliability of the sampling, in obtaining compositions from school children. A reversal of the situation was therefore tried; the children were required to judge compositions of known value, and scored according as their judgments were in accord with the judgment of a large number of adult judges. A higher correlation with estimated ability in composition was obtained from this test, than from single samples of written work, as rated on the Willing scale. This test was supplemented by the reading vocabulary test, as covering the important informational element, in English work.

The Relation of Degree of Indian Blood to Score on the Otis Intelligence Test. WALTER S. HUNTER assisted by ELOISE Sommermier, The University of Kansas.

The study is an application of the 1919 edition of the Otis test to 715 American Indians at Haskell Institute, Lawrence, Kansas. Official records of the degree of Indian blood in the subjects

made possible comparisons between degrees of Indian blood with respect to score. Results for whites were furnished by Dr. Otis.

The median score for all Indians is 82.64, σ 36.7, and for 1366 fifteen year old whites 122.58, σ 30.9. This relationship holds between whites and Indians also for the years 14-18 inclusive. The partial correlation (using only the Indians) for the $4/4$, $3/4$, $1/2$, and $1/4$ degrees of Indian blood and total score on the test, with age and total months of schooling constant, is .41. The Pearson formula applied to the four degrees of blood and the 15-year-old whites gives a correlation of $.64 \pm .008$. When a representative one tenth of the 15 year old whites are used, the correlation is $.51 \pm .017$.

The quartiles for total score decrease consistently with an increase of Indian blood. The median scores on each of the ten tests making up the scale decrease with a decrease in white blood. The percentage of individuals testing at and above the Otis age norms decreases with increase of Indian blood. The percentage testing below age increases with an increase of Indian blood.

A consideration of the factors of sex, age, social status, total months of schooling, and grade in school leads to the conclusion that the most probable causal factor involved is one of racial differences either of intelligence or temperament.

Group-Test, Will-Profile. JUNE E. DOWNEY, University of Wyoming.

In order to make the Will-Temperament tests, which, when presented in form of a graph, are called the Will-Profile, available for extensive use, a group form of testing is desirable. To determine the feasibility of such group-testing, the scale was given to 140 college students, to 110 high-school students, and to 50 seventh and eighth grade pupils. As far as possible the procedure in the individual form of the scale was retained. It was necessary to shift from a work-limit to a time-limit basis, and to substitute pencil for pen records, changes which necessitated the establishment of new norms of scoring.

Group-testing proved fairly successful for speed of movement and of decision, freedom from load, motor inhibition, motor impulsion, coördination of impulses, and, possibly, for volitional perseveration. It was found necessary to substitute other tests for reaction to contradiction and to opposition and for revision, and to elaborate all instructions so as to guard against misunderstanding.

The giving of the group Will-Temperament Scale to high-school and grade children makes considerable demand on the personality of the examiner. In comparison with the individual form of the tests there was noticed an influential social factor operating, particularly in case of speeding or retardation of movement.

Extensive utilization of the Group Test will make it possible to establish norms for different performances at a great variety of ages. Records from individuals indicate very significant age differences at both extremes of life and suggest some interesting conclusions concerning both the acquisition and the loss of capacity and the connection between intellectual and temperamental maturity.

The Group Test does not permit one to make the many subtle observations possible in individual testing. For clinical work the latter will always be more satisfactory.

Some Results of Intelligence Tests in School, College and Industry.

JAMES P. PORTER, Clark University.

During the past two years the writer has tested considerably more than one-thousand subjects in grammar and high schools, in college, and in industry.

The Otis group Intelligence Scale, Forms A and B have been used in nearly all cases. Too recently for more than bare mention in this report some two hundred office employees in industry have been tested with the Otis general intelligence examinations.

1. The total scores obtained with the various groups agree with results of other similar studies in showing the widest individual differences within the groups and the extensive overlapping of the groups. The highest scores of the children in the seventh grade almost reach the average or median of many of the older groups, these latter groups for the most part being composed of heads of departments and their subordinates.

2. If we compute the average percentage of accuracy for each group the same conclusions are possible.

3. For each group thus far carefully studied those who have the highest scores are the most accurate. For example in the 7th grade, in three high schools, four industrial groups, and one freshman college class, there is a difference in accuracy between those above and below the median ranging from 8 to 20 in favor of the higher half.

4. In at least some of the school groups the boys in both total score and accuracy rank higher than the girls. Those at grade-age

or younger than grade-age rank higher than those who are older than normal grade-age.

5. A Freshman class in college when given the test in October and again in June shows an average gain of 6.3 per cent. It should be added that the second test fell at the close of the final college examinations.

6. There is a moderately significant correlation between total scores of the Otis test and average grades of college freshmen.

7. A close relationship has been found with departmental heads in industry between the total scores of the Otis Tests and The Thorndike College Entrance Tests, the latter being so modified as to omit all parts in which the scoring involved personal judgment of the examiner.

The Results of Some Tests on Full and Mixed Blood Indians. THOMAS R. GARTH, University of Texas.

Problem.—To find out how Mixed and Full Blood Indians differ in the results of their performance of nine psychological tests.

Subjects.—There were 371 Indians of U. S. Indian School at Chilocco, Oklahoma, of whom 185 were males—74 being mixed blood and 112 full-blood Indians, and 186 females—80 being mixed blood and 106 full-blood Indians. Their ages ranged from 9 to 30 years. Their educational attainment ranged from the fourth through the tenth grade.

Materials.—There were nine tests, viz., four association tests: opposites, genus-species, part-whole, and free (continuous) association test; three memory tests; concrete and abstract rote memory and logical memory test; two word-building tests: acirlp, and bmtaao.

Method of Handling Results.—We have here groups of different ages, education and sex as well as different racial blood. The subjects were classified along these lines with the exception of the classification with respect to education and age which offered such difficulty that the former, according to education, had to be deferred until larger numbers could be secured. The tabulations were made for Mixed and Full Blood separately of age group accomplishment in each test and the average was found for each. The overlapping of Mixed Bloods on the Full Blood distribution for each age group was calculated. The sexes were kept separate. Some effort was made to evaluate the educational attainment of the groups.

Results.—The results of the two methods of handling the data—averages and overlapping, indicate that generally the Mixed Blood age groups are superior to the Full Blood groups. However, since the educational attainment of the Mixed Blood seems to be on the average one year more than that of the Full Bloods this fact may account for some of the differences. It is interesting to observe that some Full Bloods do as well as many Mixed Bloods.

Conclusion.—Because of the fact that the educational element could not be kept constant within the groups we are not willing to agree that these differences are racial differences. Individual differences can account for a large part of the differences as well.

APPLIED PSYCHOLOGY

Some Empirical Tests in Vocational Selection. HERBERT W. ROGERS
Yale University.

1. Three groups of typists examined with psychological tests; one group at the beginning of their practice curves, one group at varying points in their practice curves, and one group near the end of their practice curves.
2. Correlations of the individual tests with achievement in typing and correlation of a team of four tests, weighted by means of weights assigned by the method of multiple correlation, with achievement in typing.
3. The scatter formula as a means of measuring the accuracy of predictions made by means of the line of regression.
4. The scatter formula as a means of determining the practical value of a coefficient of correlation and of determining what constitutes a "significant coefficient of correlation."

Further Data on the Influence of Race and Social Status on the Intelligence Quotient. ADA HART ARLITT, Bryn Mawr College.

The tests used were the Stanford Revision of the Binet tests. These were given by the author and four graduate students, all experienced testers. The children, 304 in all, were taken from the primary grades. Of these, 169 were the children of native born white parents, 68 were Italians and 67 were Negroes. All of the Italians spoke English without difficulty.

The total group was first divided according to social status. Twenty-three were of very superior social status, 48 of superior, 84 of average, 77 of inferior and 71 of very inferior social status.

The median Intelligence Quotients for the groups were respectively 125.9, 118.7, 106.5, 87 and 83.4, showing a wider difference between the children of different social status than is usually reported.

The children were then divided into groups on the basis of race alone. The median I.Q. for the native born white group was 106.5, for the Italian group 84.3 and for the Negro group 83.4. The disparity between the three groups was marked. However, 90 per cent. of the native-born white children came from families of average or superior social status, whereas 88.2 of the Italian and Negro children came from families of inferior and very inferior social status. In order to eliminate the difference due to social status the Italian and Negro groups were compared with the native white group of children from families of inferior and very inferior social status. The median I.Q. for the native white group was then 92, that is 8.6 points above that of the Negro and 7.7 points above that of the Italian group. The curve of distribution of Intelligence Quotients of the Italian and Negro groups is skewed markedly to the side of inferior ability as compared with that of native-born white children of the same social status. This difference seems to be racial.

The number of children tested is too small to make it possible to draw conclusions which will be universally applicable but the results seem to show that, although there is a difference which is due to race alone, the disparity between children of the same race but of inferior and superior social status is greater than that between children of different races.

Modification of Will-Temperament Tests for Group Testing. M. J. REAM, Carnegie Institute of Technology. (Introduced by C. S. Yoakum.)

Measurements of volitional characteristics are a needed supplement to intelligence test scores in predicting school success, and such measures become increasingly important with less literary occupations such as that of salesman.

To facilitate such testing the individual Will-Temperament test of Professor Downey has been modified at Carnegie Institute of Technology so that a large group can be tested at one time. In the individual test the time on each part is recorded, whereas in the group adaptation the time allowed is kept constant and the amount accomplished is the variable to be measured. The following items of the Downey test are retained: speed of movement, freedom from

load, flexibility, speed of decision, motor impulsion, assurance, motor inhibition, interest in detail, coördination of impulses, and volitional perseveration. Resistance to opposition is not used, but a measure of self-consciousness is added. The group test is printed in pamphlet form and can be given in twenty minutes.

The test has been given to six hundred freshmen of the day school and to several schools of Life Insurance Salesmanship at the Carnegie Institute of Technology. Charts are presented showing the already demonstrated value of Will-Temperament tests in predicting the success of salesmen.

The Inspiration-Expiration During Truth and Falsehood. HAROLD E. BURTT, Ohio State University.

The inspiration-expiration ratio (I/E) was recorded with an improved technique while the subject was lying (L) or telling the truth (T). The average I/E for the 3 to 5 breaths following the subject's answer was subtracted from the average I/E for the 3 to 5 breaths between the experimenter's question and the subject's reply. The hypothesis under investigation was that this difference (D) should be negative for L and positive for T .

In some series the subject lied or told the truth about cards containing letters and numbers. Other series involved imaginary crimes with the subject fabricating an alibi or recounting one prepared by an assistant. In some instances a group of spectators were present.

Averaging the D 's for T and L separately, there is a considerable corroboration of the hypothesis with both kinds of material. This result is due primarily to a few crucial questions. D is in many instances approximately zero but occasional marked deviations occur in both directions. The problem of diagnosing two "crimes" covered in an hour's experiment, one known to be T and one L , is solved successfully in 73 per cent. of the cases. Systolic blood pressure (measured incidentally) makes this diagnosis in 91 per cent. of the cases. It appears that practically as good a diagnosis can be made by using the first breath following the experimenter's question in comparison with the first one following the subject's reply.

The lying consciousness appears to have an emotional (probably fear) content and it is possible to influence expressive measurements somewhat by emotional control. It is thus important in practical work upon deception to use a combination of several methods.

Will "Industrial Relations" Survive the Outgoing Industrial Tide?

ELLIOTT FROST, Rochester Chamber of Commerce.

The chief compelling motive power behind the work of the world is the desire for group approval. This made possible, during the War, the speeding up of production and heightening of morale. Since then, consumption has increased and production decreased until we find ourselves caught in an ebb tide, industrially speaking. And the failure of numerous panacea to stem it has inclined the manufacturer to be wary, if not suspicious, of all proposals to help him.

Coöperation among employees is favored—first, when the community is small; second, when its industries are diversified; third, when business is good; fourth, where quality of products outranks quantity, and fifth, where industries are locally controlled. Coöperation among employees is favored where men work in an open shop, are satisfied with their wage, like their foreman, and where both shop and home conditions are good. Coöperation as between employer and employee is possible only where each holds the right attitude and each understands the other.

Militating against these various forms of coöperation are—first, the behavior of labor, especially during the last two years; second, the failure of many welfare programs; third, the theorists who have been trying to run industry, and fourth, the irritating interferences by the government.

In spite of these handicaps, something permanent has been gained. It is becoming increasingly possible for a conservative science to meet particular industrial needs. The Bedaux Point System illustrates this.

Industrial Relations will not go out with the ebb tide although many particular forms which have been set up will be swept away. A reconsideration of the human relations in industry has come to stay. How soon we shall stabilize industrial relations depends largely upon the employers' education. This in turn depends upon the Industrial Relation man's conception of his job, and his ability to analyze and use the psychology inherent in it.

Experimental Development of the Graphic Rating Method. MARY H.

S. HAYES and DONALD G. PATTERSON, The Scott Co. Laboratory.

The Graphic Rating Method is a new method for securing the judgment of superiors on subordinates. Two basic features are involved: (1) the rator is freed from direct quantitative terms in

judging men; (2) the rator can make as fine a discrimination of merit as he chooses.

Graphic rating scales are simple, self-explanatory, concrete and definite. The qualities included in the scales are objective, and conceded to be of general importance for success.

The Graphic Rating Method was subjected to extensive experimental trial. Ratings were secured on a variety of groups of workers, such as clerks, carpenters, draftsmen, machine operators, and assemblers. Practically all groups were rated independently by two supervisors, and for certain groups three successive ratings were secured.

The Graphic Rating Method was found to be highly reliable, as shown by the close relationship between ratings on the same men by the same judge for different months, and by the close relationship between ratings on the same men by different judges. High correlations were found between ratings given to the same workers in the first month and in the second and third months by each of the supervisors. The correlations between the second and third ratings were even higher for each and every supervisor.

Not only was each supervisor consistent in agreeing with himself from month to month, but he also agreed with other supervisors whose ratings of the same workers were equally reliable. Correlations over $+.65$ were the rule.

Some supervisors tend to rate all of their workers too high and some tend to rate all of their workers too low. These differences were found to be so great as to require the reduction of the ratings of each supervisor to a common basis by the method of statistical correction. This is done by dividing the distribution of the ratings given by each supervisor into five classes on a percentage basis. Each total rating is thus converted into a final letter rating. It is evident that these final ratings remove the error arising from differences of standard of judgment, while they preserve all real disagreements. Radical disagreement of two or more letter steps occur in only a small percentage of the cases. In practice such radical disagreements are eliminated by conference of the disagreeing supervisors with subsequent re-ratings.

The Fluctuations of the I. Q. of Normal and Superior Children at Successive Examinations. BIRD T. BALDWIN and LORLE I. STECHER, University of Iowa.

Examinations of normal and superior children in the Observation

School of the State University of Iowa under standardized conditions by the Stanford Binet scale annually since 1917 show considerable fluctuation in the I.Q. of the same individual on successive tests. This difference in I.Q. is very rarely sufficient to take a child from one mental class to the next higher or lower, *i.e.*, average children remain average and superior children, superior.

An analysis of each child's deviation on successive examinations from his average in all examinations shows superior children to be more variable and average children to be more even in their mental development. Children who are older chronologically also are more variable than are younger children.

Taking the sexes separately, children who are physically superior average higher in mental age at a given chronological age than do children who are not so well developed.

There is a general tendency for the I.Q. to increase at later examinations especially in the case of older children and of children of superior mentality. The Pearson coefficients of correlation for each examination with every other examination are high, with a small P.E. The correlation between the first and second I.Q. was $+.85$, between the first and third $+.746$, between the first and fourth $+.780$.

COMPARATIVE PSYCHOLOGY

An Experimental Study of Equilibration in the White Rat. COLEMAN R. GRIFFITH, University of Illinois.

Although the general facts of organic equilibration have long been known, more attention has been directed to the problem of relating these facts to the semicircular canals than to a faithful description of the facts themselves. It may now be safely assumed that acceleration in bodily rotation constitutes the usual condition for inciting the end-organs in the semicircular canals. Such a disturbance is followed by the general equilibratory or compensatory events frequently noted. The events themselves, however, need experimental analysis and specific description.

In the white rat these events include a to-and-fro movement of the eyes known as "ocular nystagmus," a to-and-fro movement of the head of the same nature, a pupillary reflex, innervation of almost all, if not all, of the gross musculature leading to violent, spasmodic contraction of various types, and finally, organic or visceral disturbances resulting in defecation and micturition or delivery in case

the subject is a pregnant female of two weeks or more. All of these events appear to be of vestibular origin and the ocular nystagmus is representative of them all.

The experimental problem, then, is to determine the effects, immediate and remote, of short, moderate and prolonged rotation, of slow, moderate and fast rotation and of constantly changing acceleration of rotation, on rats of various ages and of both sexes. By way of solution, a large number of such subjects have been rotated at various speeds and for different periods of time with the following results:

(a) A description of the behavior of rats under all conditions of rotation.

(b) The average time of nystagmus for age and sex differences and for rate and length of rotation.

(c) The effect of repeated rotation.

(d) The results of nine months of unbroken rotation.

The Influence of the Time Interval upon the Rate of Learning in the White Rat. JOS. U. YARBROUGH, Southern Methodist University.

Treatises on general psychology indicate that simultaneous or successive presentation is the essential condition in the formation of an effective association, meaning by "successive" that the two experiences must be in temporal contact with each other. The purpose of these experiments was to enter certain definite time intervals between the terms and observe their influence upon the rate of learning the association. Two terms, X and Y , were separated by certain time intervals, and the influence of these varying intervals upon the rate of learning the association was observed when the terms were presented in the forward ($X - Y$) and in the reverse ($Y - X$) order.

Our data warrant the following conclusions: (1) The difficulty in learning the association does not increase proportionately with the increase of the time interval between the two terms to be associated. (2) The point of disproportionate increase in difficulty is between 1 and 2 secs. It appears but little more difficult to learn the association when the two factors are separated by 1 sec. than when they are in temporal contact; likewise, no marked difference is manifest between the intervals immediately above 2 secs. (3) The sense materials used are an important factor in determining the rate at which the association is learned. And (4) association in the backward direction is very little, if any, more difficult than

in the forward direction when the continuous mode of presentation is used. If, however, the terms to be associated are separated by a time interval of 1 sec. or more, the association is perhaps impossible.

A Pursuit Meter. W. R. MILES, Carnegie Nutrition Laboratory, Boston.

This is a new apparatus for measuring the adequacy of eye-hand coördination which is probably one of the most important forms of human behavior to measure in connection with nutritional factors, fatigue, industrial conditions and the like. The subject under test observes a wattmeter with zero center scale and by the manipulation of a rheostat tries to continually maintain a balance between two opposing electrical circuits. The task is fairly uniform in nature but so varied as to the direction, amplitude, rapidity of fluctuations, and rate of change in the current strength of one circuit as to require constant attention from the reactor. The "disturber mechanism" can be regulated to provide tasks of varying difficulty. The errors of compensation are integrated in two meters from which the score may be directly read at the end of a test. Obviously the score combines both quickness and accuracy and the smaller the meter reading the better the performance. Test results with children and adults may be directly compared. The use of the apparatus is illustrated by some data on the influence of small amounts of alcohol.

A Satisfactory Control in Tobacco-Smoking Experimentation. CLARK L. HULL, University of Wisconsin.

Since the work of Rivers and Hollingworth, everyone recognizes the necessity of a control dose in drug experimentation. In the case of smoking however, Rivers and others have considered a control impossible. While requiring some adroitness in administration, the following method has proven very satisfactory in practice, with fifteen different subjects working eighteen days each. In no case were they given any suggestion that a control was to be used. On half of the experimental days the subjects smoked ordinary tobacco in an ordinary pipe, blindfolded. The experimenter handled the pipe exclusively. On the remaining days the ordinary pipe was replaced by a special experimental pipe. This was never seen or suspected by the subjects. It had installed in its bowl an aluminum capsule within which was some asbestos plaster and two asbestos insulating tubes. Within the tubes was a coil of twenty-five turns

of a special electrical heating wire. A direct current of suitable proportions was led into the coil from a rheostat. Some hours before the experiment a few drops of water were placed on the plaster to be thoroughly absorbed. The air drawn through this system by the suction of the smoker became heated to any extent desired by the experimenter and furnished the basis of the illusion. In addition a sound was produced and a resistance offered to suction, resembling the real pipe. The similarity of the stems made the sense of contact the same. Unknown to the subject the experimenter himself sometimes smoked a little on the ordinary pipe at the same time to produce an odor. Before the dose on the control days, the experimenter without making any further suggestions, would clean out rather elaborately the real pipe in the presence of the subject. Numerous other psychological devices of a suggestive nature were utilized to the same end. Under these conditions, confirmed smokers would puff the warm air with evident satisfaction and even go serenely through the motions of blowing smoke rings. In the few cases where the attempt was made, it was found difficult to persuade subjects verbally that they had not smoked on every one of the eighteen days.

Measurement of Psychological Differences between Advertising Mediums. HARRY DEXTER KITSON, Indiana University.

This investigation represents an attempt to devise a method for the determination of the intellectual status of advertising mediums. The advertiser desires to know which mediums are best suited for the announcement of his wares; and what differences exist among the various appropriate mediums, so that he may adapt his message intelligently to each one. It is generally agreed that there are psychological differences between periodicals which carry advertisements. One passes currently as "highbrow," another as "lowbrow"; one as the organ of the "labor" vote, another as the organ of the "wet" element. If such differences exist we ought to be able to demonstrate them and evaluate them mathematically. To devise a technique for this is the aim of this investigation.

The method employed was to choose one newspaper and one magazine of alleged elevated intellectual standing; and one newspaper and one magazine alleged to have less pretensions intellectually; to compare them with respect to frequency of "long" and "short" words; "long" and "short" sentences; and the frequency of occurrence of "difficult" words from Ayres' list of 1,000 most common words.

Results show marked differences in the respects mentioned; the greater number of "long" words, "long" sentences and "difficult" words occurring in the periodicals of reputed higher intellectual standing.

This investigation, though undertaken in the interests of the advertiser who desires guidance in the selection of appropriate advertising mediums and the adaptation of his message thereto, is of interest to general psychology. It shows the possibility of investigation of that form of group mind known as the "public," and thus points suggestively toward the much needed experimental foundation for social psychology.

Choice and Preference in Occupations. C. S. YOAKUM & B. V. MOORE, Carnegie Institute of Technology.

A list of occupations was presented to one hundred and eighty-four life insurance salesmen, sales engineers and design engineers. This list contained two groups of occupations equal in number. One group was judged to be similar to salesmanship; the other contained occupations more closely related to engineering. All the occupations related to engineering were from lower level occupations than engineering itself. The sales and design engineers had been engaged in their chosen field not less than one year nor more than five. Only a few of the life insurance men had had more than a few months' experience. Thus all of these men had made an occupational choice. They were asked to consider only their interest and satisfaction in doing each of the occupations listed; then to mark plus those they would most prefer to do and to mark minus those they would dislike doing.

The total of pluses and minuses for the life insurance men indicating preference for "sales" occupations and *against* "engineering" occupations was seventy-seven per cent of all marks. For sales engineers, this total was 67.7 per cent. of all marks. The design engineers showed a preference per cent favoring sales of 30.3. If we continue the assumption that the "occupations" are properly related to "sales" and "engineering," 78 per cent. of the engineers showed sales preferences, and 82 per cent. of the design engineers exhibited preference for engineering occupations.

SOCIAL PSYCHOLOGY

A Study of the Methods of Revivalists. W. T. SHEPHERD, Washington, D. C.

This paper is a report of a study conducted to ascertain the various methods employed by ministers and professional revivalists in conducting revivals. The study included ten ministers who conducted their own revivals, ten professional evangelists, and five additional evangelists whose methods were observed by the writer. In the cases of the ten ministers and ten evangelists, the questionnaire method was employed.

1. A strong emphasis was placed by them on a plain, earnest presentation of the Scriptures. This should be accompanied by the Holy Spirit, believing prayer, and Cottage Prayer Meetings preceding the revival.
2. Many ministers and evangelists do things without knowing just why.
3. All believe in advertising to more or less degree.
4. Music plays a great part in revivals, and should be as attractive as possible.
5. All appeal to the fear of death and Hell. Some do this unconsciously.
6. Hope of reward is appealed to. But they minimize its importance.
7. Other feelings, as shame, love, self-respect, conscience, are appealed to.
8. The answers showed a poor knowledge of psychology. However, suggestion is used, especially by evangelists.
9. In every great revival, organized effort is important.
10. Results are attributed by them to faithful presentation of "The Gospel," influence of the Holy Spirit, prayers, personal work, service.
11. Preaching the Scriptures ("The Gospel"), the Holy Spirit, personal work are most relied upon by them.
12. Many evangelists and ministers are not students of their work.
13. Their agreement was nearly unanimous that converts remain in the church.
14. The average age of conversion given by them was seventeen years. No distinction was made by them in that regard as to sex.
15. They say men (and women) seldom tell their real objections to uniting with the church. Those they give are mostly evasions.

A Comparison of Oriental and American Student Intelligence. KARL T. WAUGH, Berea College.

A series of mental tests were given to the First Year college students of three institutions in India and one institution in China.

The tests selected for this work were the same as those given for a series of years to American college freshmen, the results of which were reported at the meeting of this association, held in Chicago, December, 1915.

The investigation forms a study in comparative racial psychology, and, taken in connection with the previous work on Mental Tests of American College students, makes a contribution to the solution of the problem of the relative mental effects of heredity and environment. The Indian and American subjects represent the *same* racial stock, viz., the Aryan, but differ from one another by all the environmental features that distinguish the Orient from the Occident. The Chinese and American subjects, on the other hand, are compared as representatives of *different* racial stocks.

The tests given were for (1) concentration of attention, (2) learning speed, (3) association time, (4) memory—immediate, (5) memory—deferred, (6) range of information.

The cancellation, substitution, opposites and logical memory tests, in the exact form given to American students, were given to students of equivalent grade and age of the Lucknow Christian College, the Isabella Thoburn College, Lucknow, and the Forman Christian College, Lahore, India.

The tests, with the exception of those for memory, were given in the usual form, to the college students of the Canton Christian College, Canton, China.

Percentile curves and frequency curves are presented giving the group attainments in the several tests, the curves for the American, Indian, and Chinese students being shown on the same plot for comparison.

The following is the order of attainment of the racial groups, the median being used in each case: *Attention*; American 75, Chinese 64, Indian 62. *Learning*; American 66, Chinese 62, Indian 45. *Association*; Indian 58, American 46, Chinese 38. *Memory-Immediate*; American 58, Indian 54. *Memory-Retention*; Indian 88, American 80. *Information*; Indian 24, American 23, Chinese 15.

Standpoint of Social Psychology. ROBERT H. GAULT, Northwestern University.

Psychology is the indispensable basis for the study of social life: *i.e.*, of life in as far as it is characterized by an interaction and interstimulation among persons.

Social psychology is but a convenient term applied to the general science when its methods are employed in analyzing and describing the development and present status of these interactions and interstimulations. They are not necessarily conscious relations that are connoted by this phrase. Such relations may be purely matter-of-course when we meet them in our daily experience, though in their early history they may have been in distinct consciousness.

The student of psychology in its bearings upon social problems need make no more and no fewer assumptions than the student of the same science makes in any other of its relations.

It is wholly unnecessary to assume the existence of a group mind, social mind, or crowd mind in the sense in which these phrases are usually employed. They are ordinarily invoked to account for the sense of "social unity" and for what is termed "progress." The writer attempts to account for each of these phenomena, using such equipment of the individual as is familiar to the student of functional psychology as a starting point.

Preliminary Report on a Gifted Juvenile Author. LEWIS M. TERMAN, Stanford University.

Betty F., born January 22, 1912, has written enough poems and stories to fill a fairly large volume. She began composing jingles at the age of 33 months, but most of her recorded work dates from her seventh birthday. She composes with astonishing facility, ordinarily requiring only five or ten minutes to dictate a poem or story of 200 to 600 words. Stories and poetical plays of 1,500 to 2,500 words are dictated in from one to two hours. Betty frequently improvises poems and stories on themes selected by others. A poem so composed in two minutes and fifty seconds was compared with 21 other poems on the same theme improvised in fifteen minutes by advanced students of English poetry at Stanford University. When these were typed and rated by 35 judges, Betty's production ranked slightly above the median. Similar comparisons of her best work with the work of recognized authors indicate that Betty has very promising ability. Analysis of 72 poems and 69 prose

compositions shows a large predominance of nature themes in both groups. The range of subjects, however, is very wide and includes the reflective, the whimsical, the humorous, love poems, poetical plays, blank verse, free verse, prose poems, fairy stories and detective stories.

Shortly before her eighth birthday Betty's I.Q. by the Stanford-Binet was 188, and by the Army Beta 175. In year XIV she passed vocabulary, problems of fact, and induction; in XVI vocabulary, fables, and 6 digits reversed; in XVIII, paper cutting and 7 digits reversed. Numerous other intelligence tests have been given her, with similar results. Taking the memory for digits test (group method) with a class of 21 Stanford graduate students she excelled 10, tied 4, and was beaten by 7. Her vocabulary score at 8 years was 73, or about that of average university freshmen. On the other hand, in the Kelley Construction Test and in arithmetical computation she is only slightly above age. Physical development averages about two years advanced. Health record has been exceptionally clear. Is kinetic and emotional. Parents first knew she could read when they discovered her, at the age of 4 1/2 years, reading Heidi. By eight she had read 750 books, many of them two or more times. Has not attended school and has had only a small amount of private instruction. Parents are intelligent but not particularly exceptional.

Belief as a Derived Emotion. W. McDUGALL, Harvard University.
(Introduced by H. S. Langfeld.)

The difficulty of classifying "belief" as a mode of experience. I propose to class it (with confidence, hope, anxiety, despondency and despair) as one of the derived emotions. The propriety of classing all these as emotions may be questioned; but, unless we deny that hope and despair can be properly called emotions, we cannot deny it of belief and confidence for they are of a similar nature; they are all alike conditioned by the influence of cognitive on conative process. "Confidence" is one extreme term of the series of emotional experiences connected with, or grounded in, the working of desire. "Belief" is "Confidence" upon the intellectual plane of mental life. No "belief" without desire. "Faith" is "belief" on the plane of volition.

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- EDWARDS, A. S. *The Fundamental Principles of Learning and Study*. Baltimore: Warwick & York, 1920. Pp. 239. \$1.80.
- MARTIN, L. J. *Mental Hygiene. Two Years' Experience of a Clinical Psychologist*. Baltimore: Warwick & York, 1920. Pp. 89. \$1.40.
- THOMPSON, C. B. *Mental Disorders, Briefly Described and Classified*. Baltimore: Warwick & York, 1920. Pp. 48. \$.75.
- MONROE, W. S. & BUCKINGHAM, B. R. *Illinois Examination. General Intelligence, Silent Reading and Operations of Arithmetic*. Urbana: University of Illinois. 1920. Pp. 31.
- WILLIAMS, J. H. A Survey of Pupils in the Schools of Bakersfield, California. *Publ. of the Whittier State School, Whittier, Calif., Bull. No. 9*, June, 1920. Pp. 43.
- TISSERAND, P. *Mémoire sur les Perceptions Obscures de Maine de Biran*. Paris: Colin, 1920. Pp. xii + 66.
- RENOUVIER, C. *Les Principes de la Connaissance humaine de Berkeley*. Paris: Colin, 1920. Pp. xii + 107.
- HERMANN, O. *Dr. Klages' Entwurf einer Charakterkunde*. Leipzig: Barth, 1920. Pp. 63. 15 M.
- ERDMANN, B. *Grundzüge der Reproduktionspsychologie*. Berlin & Leipzig: De Gruyter, 1920. Pp. viii + 186. \$1.40.
- JAENSCH, E. R. *Einige allgemeinere Fragen der Psychologie und Biologie des Denkens, erläutert an der Lehre vom Vergleich*. Leipzig: Barth, 1920. Pp. 31. 4 M.
- HEINITZ, W. *Wie Lassen sich Experimental-phonetische Methoden auf die Psychologische Zergliederung Gesprochener Sätze anwenden?* Kiel: J. J. Augustin, 1920. Pp. 35.
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- DAINOW, M., & MASON-THOMPSON, E. R. (1) *A Classification of Association Categories and their Use in Testing General Intelligence*. (2) *A Test for the Quick Grading of General Intelligence by Groups*. London: Pelman Laboratory, 1920. Pp. 23.

- TANSLEY, A. G. *The New Psychology and its Relation to Life*. New York: Dodd, Mead, 1920. Pp. 283.
- BERGSON, H. *Mind Energy*. (Trans. by H. W. Carr.) New York: Holt, 1920. Pp. x + 262.
- LAY, W. *Man's Unconscious Passion*. New York: Dodd, Mead, 1920. Pp. vii + 246.
- MAGNUSSEN, J. *God's Smile*. New York: Appleton, 1920. Pp. ix + 185. \$1.75.
- WATT, H. J. *The Foundations of Music*. Cambridge, Eng.: Univ. Press, 1919. Pp. xvi + 239. 18 s.
- ENO, H. L. *Activism*. Princeton: Univ. Press, 1920. Pp. iv + 203. \$1.50.
- BAGG, H. J. *Individual Differences and Family Resemblances in Behavior*. Arch. of Psychol., 1920, No. 43. Pp. v + 58. 70 cts.
- PAYNTER, R. H., Jr. *A Psychological Study of Trade-Mark Infringement*. Arch. of Psychol., 1920, No. 42. Pp. 72. 85 cts.
- LINK, H. C. *Employment Psychology*. New York: Macmillan, 1919. Pp. xii + 440.

NOTES AND NEWS

DR. SAMUEL W. FERNBERGER, of Clark University, has been appointed assistant professor of psychology at the University of Pennsylvania.

THE last number of volume 10 of the *Psychologische Studien* under date of 1918 but only recently received, has the announcement that the publication will be discontinued. The *Studien* was founded in 1906 by the late Professor Wundt, who was also its editor.

WITH the opening of its thirty-second volume the responsible editorship of the *American Journal of Psychology* passes from President G. Stanley Hall, of Clark University, to Professor Titchener, of Cornell University. Under Professor Titchener's direction the *Journal* will be restored to its pre-war size of 600 pages. Professor Titchener will be assisted in the editorial conduct of the *Journal* by the following staff of associated editors: G. Stanley Hall, Edmund C. Sanford, Edwin G. Boring, of Clark University; H. P. Weld, Karl M. Dallenbach (business editor), of Cornell University;

Madison Bentley, of the University of Illinois; W. B. Pillsbury, of the University of Michigan; Frank Angell, of Stanford University and Margaret F. Washburn, of Vassar College.

THE following have been taken from the press:

ARRANGEMENTS have been made by the faculty and trustees of the University of Chicago for the painting of the official portrait of James Rowland Angell, formerly dean of the faculties and head of the department of psychology at the university, who is now head of the Carnegie corporation of New York.

PROFESSOR E. J. SWIFT, of Washington University, has been invited by the administrative officers of the post-graduate school of the United States Naval Academy at Annapolis to repeat the lectures which he gave before the officers and students last spring on "Thinking and Acting" and "The Psychology of Managing Men."

THE Technical High School at Brünn, Czechoslovakia, desires to raise a fund in honor of Ernest Mach, who was born in that neighborhood. The purpose of the fund is to award a prize for an essay, dealing with the subjects of his interest. Subscriptions may be sent directly to Dr. Emil Waelsch at the address given.

THE council of the British Association for the Advancement of Science has agreed to the formation of a separate section of psychology, as recommended by the sections of physiology and educational science at Cardiff, and approved by the general committee.

MR. J. W. BARTON, recently fellow in psychology at the University of Minnesota and formerly a member of the faculty of the University of Utah, has been elected associate professor of psychology in the school of education of the University of Wyoming.

AT a recent meeting of the New York Academy of Sciences, Dr. Edward L. Thorndike was elected president and Dr. Robert S. Woodworth one of the vice-presidents for 1921.

THE Aldred lecture was delivered at the Royal Society of Arts on January 12, by Dr. C. S. Myers, of the University of Cambridge the subject being "Industrial Fatigue."

AT the Chicago meeting of the American Association for the Advancement of Science, the Committee on Grants made the following distribution for the year 1921:

ONE hundred and fifty dollars to Professor T. R. Garth, of the University of Texas, for a psychological study of Indian children in the United States Indian schools at Chilocco, Oklahoma, and Albuquerque, New Mexico.

ONE hundred and fifty dollars to Professor E. G. Boring, Clark University, for the preparation of a set of steel acoustic cylinders to be used in determining the nature of sensory response under conditions of normal psychometric situation.

